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# Emotion recognition and alexithymia in high functioning females with autism spectrum disorder

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ABSTRACT

Although there is a wealth of information on the emotion recognition skills of males with autism spectrum disorders (ASD), not much is known about these skills in women with ASD. This study investigates the relation between alexithymia and emotion recognition in this group. 31 high-functioning females with ASD and 28 age matched typical females performed a vocal and visual emotion recognition task and completed an alexithymia questionnaire. Level of intensity of the presented emotions was manipulated in the visual emotion recognition task between 25% (low intensity) and 100% (full emotion intensity) in 25% increments. There was no evidence of impairments in the accuracy of visual or vocal emotion recognition. Both groups were equally affected by level of intensity. Level of alexithymia was higher in women with ASD in the cognitive domain. Within the ASD group, women with high levels of alexithymia attained lower scores on visual emotion recognition in the lowest intensity condition, suggesting that being able to identify one's own emotions may help in processing subtle emotions.



## 1. Introduction

A diagnosis of autism spectrum disorder (ASD) is made on the basis of symptoms in the realm of social interaction, communication and restricted interests (American Psychiatric Association, 2013). It has been suggested that a specific deficit in emotion processing may lie at the root of many of these symptoms, especially those pertaining to social interaction (Humphreys, Minshew, Leonard, & Behrmann, 2007; Lindner & Rosén, 2006; Philip et al., 2010; Wallace, Coleman, & Bailey, 2008). Since males represent the majority of the ASD population (with ratios up to 6:1 in a high functioning population (Fombonne, 1999), many of the findings that report on mechanisms related to ASD symptoms have been based on male (dominated) samples. Although this does not need to pose a problem in itself, mounting evidence suggests that females with ASD may have a different phenotypical presentation, highlighting the importance of gender specific research (Kirkovski, Enticott, & Fitzgerald, 2013). This is further corroborated by findings that suggests females receive an ASD diagnosis later in life compared to males (Begeer et al., 2013), and often do not meet diagnostic criteria even though they present with significant autism traits (Dworzynski, Ronald, Bolton, & Happé, 2012). As such, our understanding of ASD in females may be limited and biased. In order to come to more definite answers regarding the clinical manifestation of ASD in women, research should explore the female ASD population in more depth. The present study investigates emotion recognition in an adult

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female ASD population. We hypothesize that emotion recognition may be largely intact in women with ASD. This area is known to be affected in men with ASD (e.g., Lindner & Rosén, 2006; Uljarevic & Hamilton, 2013), and therefore this would support the notion of an alternate female phenotype for ASD. We also investigate alexithymia as a possible underlying factor for emotion recognition performance.

As studies on emotion recognition in females with ASD are lacking, we have to turn to studies of the general ASD population for background. There is a wealth of studies on emotion recognition in the general ASD population, but unfortunately empirical evidence for a specific emotion processing deficit is conflicting and varies as a function of sample size, emotion modality (i.e., visual, vocal, gestural), and type of emotion (positive, negative). The most widely investigated area concerns the visual modality. In a recent meta-analysis on 48 studies, Uljarevic and Hamilton (2013) concluded that there is indeed a general impairment in visual emotion recognition, but also that the effect size is small and there is wide variety in skills across the ASD population. With respect to the type of emotion, specific impairments have been found in regard to stimuli with a negative valence such as fear and sadness (Humphreys et al., 2007; Wallace et al., 2008).

Recognizing emotions, however, is not solely a task concerning the visual modality. Important information on the emotional state of another person can be conveyed through audition (Philip et al., 2010). Recent reports on vocal emotion recognition corroborate the notion of an auditory emotion processing deficit in ASD samples (Lindner & Rosén, 2006; Mazefsky & Oswald, 2007; Philip et al., 2010), though this has been far less studied compared to the visual domain.

The underlying mechanisms of the emotion recognition deficits of individuals with ASD are not yet well understood. One possible explanation is given by the alexithymia hypothesis, which states that individuals with ASD might in fact experience no emotion recognition deficits, but that the higher prevalence of alexithymia, an impairment in identifying and describing one's own emotional state, in this population might account for the emotion recognition deficits in individuals with ASD (Bird et al., 2010; Bird & Cook, 2013). According to the 'shared network' models of empathy (Preston & De Waal, 2002), alexithymia may result in impaired emotion recognition due to the fact that the same neural networks process both the emotional state of the self and the other. As Bird, Press, and Richardson (2011) state, an impairment in emotion processing in the self could therefore be reflected in impaired emotion recognition in others or even in music (Allen, Davis, & Hill, 2013). Alexithymia has been connected with a reduced ability to recognize emotions both in the general population (e.g., Prkachin, Casey, & Prkachin, 2009; Swart, Kortekaas, & Aleman, 2009) and more recently in the ASD population (visual emotion recognition: Cook, Brewer, Shah, & Bird, 2013; vocal emotion recognition: Heaton et al., 2012). In addition, several studies have found alexithymia rates as high as 50% in the ASD population (Berthoz & Hill, 2005; Hill, Bertoz, & Frith, 2004), whereas the presence of alexithymia in the general population is thought to be around 10% (Salminen, Saarijärvi, Äärelä, Toikka, & Kauhanen, 1999).

There is reason to be cautious in assuming that the male dominated research on emotion recognition in individuals with ASD can be superimposed on the female ASD population. Several studies found females with a diagnosed ASD to have a stronger interest in socialization (Kopp & Gillberg, 1992), to show fewer social problems in childhood (Mandy et al., 2012) and fewer ASD symptoms in adulthood (Lai et al., 2011) compared to men with ASD, although a higher rate of social-emotional problems has also been reported especially in older age groups (Holtmann, Bölte, & Poustka, 2007; McLennan, Lord & Shopler, 1993). Explanations for this negative effect of age on social problems in females with ASD have varied from higher social expectations, the development of comorbid conditions such as anxiety and depression, and the idea that relationships between females are more dependent on communication. As such, it may be hypothesized that emotion recognition skills in females with ASD are on par with that of typical females. Of the 48 studies in the meta-analysis by Uljarevic and Hamilton (2013), none included a significant number of females, and seven studies even excluded females altogether. One of the only studies with enough female participants found a general impairment in visual emotion recognition for an adult ASD group (Lai et al., 2012). As no differences emerged as a function of gender, Lai et al. concluded that both men and women with ASD show equal visual emotion recognition impairments. As far as the authors are aware of, no studies with a significant number of female ASD participants have been conducted to draw any meaningful conclusions regarding vocal emotion recognition. The few studies that did look into vocal emotion recognition in females yield conflicting results. For instance, though Golan, Baron-Cohen, Hill and Rutherford (2007) did find more severe impairments in vocal emotion recognition in their small group of females with ASD compared to men with ASD, Philip et al. (2010) failed to find evidence for such a gender difference in their small ASD group (16 males, 7 females).

In conclusion, more research into the clinical manifestation of ASD in women is required. Our study aims to gain more insight into emotion processing skills in this group, in terms of perceiving and understanding emotions of others. In addition, we investigate the role of alexithymia in emotion recognition, to verify whether the alexithymia hypothesis can explain the emotion recognition skills in this group. As far as the authors are aware of, no studies have investigated alexithymia in a female ASD population. As such, it has remained unclear how the processing of emotions of others relates to processing own emotions in females with ASD. In order to come to more thorough understanding of emotion recognition in females with ASD, the role of alexithymia has to be taken into account.

## 2. Methods

### 2.1. Procedure

The study was approved by the Ethics Committee of Leiden University. As per the declaration of Helsinki, written informed consent was obtained from all participants. Travel costs of the participants were reimbursed and a check with a